

CITY OF PHILADELPHIA
Department of Public Health
Public Health Services
Air Management Services

Statement of Basis

To: File

From: Edward Wiener

Date: 11/19/12

Subject: Plan Approval No. 12195 – Philadelphia Energy Solutions Refining and Marketing LLC (PES)

Company Information:

Philadelphia Energy Solutions Refining and Marketing LLC (PES) owns and operates the former Sunoco, Inc. (R&M) petroleum refinery at 3144 Passyunk Avenue, Philadelphia, PA 19145. The Sunoco Marcus Hook Refinery in Delaware County, Marcus Hook, PA, has been determined to be part of the same facility (see discussion below).

Project Description:

PES has submitted a Plan Approval Application to increase the heat input limits of eight process heaters as follows:

- Unit 137 Heater F-1 from 415.0 MMBTU/hr to 460.0 MMBTU/hr
- Unit 210 Heater H101 from 183.0 MMBTU/hr to 192.0 MMBTU/hr
- Unit 210 Heater 201A/B from 242.0 MMBTU/hr to 254.0 MMBTU/hr
- Unit 865 Heater 11H1 from 72.2 MMBTU/hr to 87.3 MMBTU/hr
- Unit 865 Heater 11H2 from 49.9 MMBTU/hr to 64.2 MMBTU/hr
- Unit 866 12H1 Heater from 43.0 MMBTU/hr to 61.2 MMBTU/hr
- Unit 868 8H101 Heater from 49.5 MMBTU/hr to 60.0 MMBTU/hr
- Unit 231 Heater B101 from 91.0 MMBTU/hr to 104.5 MMBTU/hr

The heaters will accept the following annual heat input throughput limits:

- Unit 137 Heater F-1 shall be limited 460.0 MMBTU/hr and 3,767,000 MMBTU on a rolling 365-day basis
- Unit 210 Heater H101 shall be limited to 192.0 MMBTU/hr and 1,643,000 MMBTU on a rolling 365-day basis.
- Unit 210 Heater 201A/B shall be limited to 254.0 MMBTU/hr and 2,120,000 MMBTU on a rolling 365-day basis.
- Unit 865 Heater 11H1 shall be limited to 87.3 MMBTU/hr and 699,000 MMBTU on a rolling 365-day basis.
- Unit 865 Heater 11H2 shall be limited to 64.2 MMBTU/hr and 500,000

- MMBTU on a rolling 365-day basis.
- Unit 866 12H1 Heater shall be limited to 61.2 MMBTU/hr and 456,000 MMBTU on a rolling 365-day basis.
- Unit 868 8H101 Heater shall be limited to 60.0 MMBTU/hr and 480,000 MMBTU on a rolling 365-day basis.
- Unit 231 Heater B101 shall be limited to 104.5 MMBTU/hr and 856,000 MMBTU on a rolling 365-day basis.

The increases do not require any physical modifications to the heaters. The heat input limits originally came from the Reasonably Available Control Technology (RACT) plan approval issued to the facility on August 1, 2000. Each heater burns refinery fuel gas.

PES also requested the following crude unit throughput limits:

- Unit 137 Crude Unit to a crude feed limitation of 200,000 barrels per day
- Unit 210 Crude Unit to a crude feed limitation of 130,000 barrels per day.

These units did not previously have throughput limits. These units do not require physical modifications to achieve these limits.

The shutdown of the crude refining units at the Marcus Hook Refinery is considered part of this project. The August 31, 2012 plan approval application is contemporaneous with the surrender of the permits for crude refining at the Marcus Hook Refinery and the August 15, 2012 filing for emission reduction credits for the shutdown. The increase of the heater capacities is related to the shutdown of the crude refining sources as the increase in heater capacities partially offsets the decrease from the Marcus Hook shutdown. it allows the .

Emission Calculations (From Plan Approval Application and Permit Limits)

Below are the potential emissions from each source or piece of equipment based on the annual MMBTU/hr heat input limits included in this plan approval.

Plan Approval Heaters

Source	Pollutant Emissions (tpy)					CO2e
	NOx	VOC	CO	PM10/PM2.5	SO2	
137 Heater F-1	231.7	10.2	155.2	14.0	1.1	173,131.3
210 Heater H101	73.1	4.4	67.7	6.1	0.5	75,512.3

210 Heater H201A/B	31.8	5.7	87.3	7.9	0.6	97,435.2
865 Heater 11H1	39.5	1.9	28.8	2.6	0.2	32,126.0
865 Heater 11H2	28.3	1.3	20.6	1.9	0.1	22,980.0
866 12H1 Heater	25.8	1.2	18.8	1.7	0.1	20,957.8
868 8H101 Heater	27.1	1.3	19.8	1.8	0.1	22,060.8
231 Heater B101	52.2	2.3	35.3	3.2	0.3	39,341.8
Total	509.4	28.4	433.5	39.2	3.1	483,545.2

NO_x emissions are based on the rolling 12-month NO_x emission limits for each heater listed in the plan approval, which were derived from the annual heat input limits and the lbs/MMBTU NO_x limits listed in the plan approval. VOC, CO, PM₁₀/PM_{2.5}, and SO₂ emissions are based on AP-42 emission factors (PM₁₀ and PM_{2.5} use the PM emission factors – PM from gas-burning estimated less than 1 micrometer in AP-42). CO₂e emissions are based on a Tier 3 factor of 0.0459 mTon/MMBTU used by the facility in GHG reports to EPA.

Below are the baseline emissions for these heaters using a 2010-2011 baseline period for each:

Source	Pollutant Emissions (tpy)					CO ₂ e
	NO _x	VOC	CO	PM ₁₀ /PM _{2.5}	SO ₂	
137 Heater F-1	194.7	7.8	118.8	10.8	4.5	157513.0
210 Heater H101	62.1	3.8	57.0	5.2	1.6	68342.6
210 Heater H201A/B	20.1	4.3	65.1	5.9	1.7	63933.5
865 Heater 11H1	26.2	1.2	18.9	1.7	0.3	25142.6
865 Heater 11H2	19.5	0.9	14.1	1.3	0.2	18589.6
866 12H1 Heater	9.0	0.4	6.6	0.6	0.1	8679.5

868 8H101 Heater	19.0	0.9	13.2	1.2	0.4	17785.4
231 Heater B101	28.2	1.2	18.6	1.7	0.2	24357.3
Total	378.6	20.4	312.1	28.4	9.2	384343.3

Net change:

Source	Pollutant Emissions (tpy)					CO2e
	NOx	VOC	CO	PM10/PM2.5	SO2	
137 Heater F-1	37.0	2.4	36.4	3.3	-3.4	15618.4
210 Heater H101	11.0	0.7	10.7	1.0	-1.2	7169.7
210 Heater H201A/B	11.8	1.5	22.2	2.0	-1.1	33501.8
865 Heater 11H1	13.3	0.6	9.9	0.9	-0.1	6983.5
865 Heater 11H2	8.8	0.4	6.6	0.6	-0.1	4390.4
866 12H1 Heater	16.8	0.8	12.2	1.1	0.0	12278.3
868 8H101 Heater	8.1	0.4	6.6	0.6	-0.3	4275.4
231 Heater B101	24.1	1.1	16.7	1.5	0.0	14984.5
Total	130.8	7.9	121.4	10.8	-6.1	99201.9

Unit 137 and 210 Crude Unit Limits

The crude units are not being physically modified and could have operated at their proposed throughput limits during the 2010-2011 baseline period. As a result, while the new throughput limits are around 15% above the throughput of these units during the baseline period, associated emissions fall under the demand growth provisions of 25 Pa Code §§127.203a(a)(1)(A) & 127.203a(a)(5)(i)(C) and 40 CFR 52.21(b)(41)(ii)(c) and are not considered emission increases for Non-Attainment New Source Review (NSR) or Prevention of Significant Deterioration (PSD).

Marcus Hook Shut Down

Source	Pollutant Emissions (tpy)					CO ₂ e
	NO _x	VOC	CO	PM ₁₀ /P M _{2.5}	SO ₂	
12-3 Crude Heater H-3006	-89.5	-4.6	-70.4	-6.4	-0.1	-92084.0
17-2A H-01, 02, 03 Heater	-57.0	-2.7	-41.2	-3.8	-0.1	-44912.0
12-3 Crude Desulf. Heater	-6.1	-0.3	-5.1	-0.5	0.0	-4819.0
15-1 Crude Heater	-136.5	-5.1	-77.2	-7.0	-0.2	-111102.0
17-2A H-04 Heater	-6.2	-0.4	-5.2	-0.5	0.0	-8250.0
MH Cooling Towers	0.0	-19.9	0.0	-10.2	0.0	0.0
Total	-295.3	-33.0	-199.1	-28.4	-0.4	-261167.0

*The Fourth Amendment to the Global Consent Decree only allows the use of 111.37 tons per year of NO_x as credits from the shutdown of units at the Marcus Hook Refinery. The allowable amounts of credits for the other pollutants are above the levels in the above table.

PA Code New Source Review (NSR) – Subchapter E and 40 CFR 52 Prevention of Significant Deterioration (PSD) Applicability Analysis

Source	Pollutant Emissions (tpy)					CO ₂ e
	NO _x	VOC	CO	PM ₁₀ /PM _{2.5}	SO ₂	
Total Project	-164.5	-25.1	-77.7	-17.6	-6.5	-161965.1
NSR/PSD Thresholds	25	25	100	15/10	40	75,000

The project is not a significant increase for any pollutants under NSR and PSD.

Permit Requirements:

Heaters

The heaters have the following NO_x emissions limits from the application:

- 0.123 lbs/MMBTU on a rolling 30-day average and 231.7 tons per rolling 12-month period for Unit 137 Heater F-1.
- 0.089 lbs/MMBTU and 73.1 tons per rolling 12-month period for Unit 210 Heater H101.
- 0.03 lbs/MMBTU and 31.8 tons per rolling 12-month period for Unit 210 Heater 201A/B. [AMS Plan Approval No. 10180, dated 2/3/11]
- 0.113 lbs/MMBTU and 39.5 tons per rolling 12-month period for Unit 865 Heater 11H1.
- 0.113 lbs/MMBTU and 28.3 tons per rolling 12-month period for Unit 865 Heater 11H2.
- 0.113 lbs/MMBTU and 25.8 tons per rolling 12-month period for Unit 866 12H1 Heater.
- 0.113 lbs/MMBTU and 27.1 tons per rolling 12-month period for Unit 868 8H101 Heater.
- 0.122 lbs/MMBTU and 52.2 tons per rolling 12-month period for Unit 231 Heater B101.

The Unit 137 F-1 Heater lowers the lbs/MMBTU limit in the RACT plan approval. The Unit 210 Heater H201A/B RACT plan approval lbs/MMBTU limit was previously lowered in the cited plan approval. The Unit 865 Heater 11H2, Unit 866 12H1 Heater, and Unit 868 8H101 Heater did not have lbs/MMBTU limits in the RACT plan approval. Some heaters also had NO_x limits for oil burning, but all heaters can now only burn refinery fuel gas.

Unit 137 Heater F-1 has a NO_x and O₂ Continuous Emission Monitoring System (CEMS). By expanding the capacity above 250 MMNTU/hr, Unit 210 Heater 201A/B is required to have a NO_x and O₂ CEMS installed under 25 PA Code §123.51 (both heaters are exempt from the opacity CEMS requirement of 25 PA Code §123.46 because they only burn gas). Compliance with the NO_x limits for these heaters shall be monitored based on CEMS data and heat input data. Compliance with the NO_x limits for the other heaters shall be based on the most recent AMS-approved stack test (initial tests are required in the plan approval) and heat input data. Each heater is also required by the RACT Plan Approval to conduct a quarterly portable analyzer test to verify compliance with these limits.

The heaters are applicable to the PM requirements of 25 PA Code §123.11 (most stringent for Unit 137 Heater F-1 and Unit 210 Heater H101 due to their size and

construction date) and Air Management Regulation II, Section V (most stringent for the other heaters). Compliance is assured by the units only burning refinery fuel gas.

The heaters are applicable to the CO requirements of Air Management Regulation VIII. Based on AP-42 emission factors, CO emissions from the heaters are well below these levels. Unit 868 8H101 also has a 400 ppm_{dv} at 3% oxygen CO limit from AMS Installation Permit. 03039 dated July 29, 2003. The heater monitors compliance with this limit using a Predictive Emissions Monitoring System required in the installation permit.

Each heater may only burn refinery fuel gas. Under Consent Decree Order 05-CV-2866, refinery fuel gas burned in the heaters must meet the hydrogen sulfide (H₂S) content limits of 40 CFR 60.104(a)(1). The facility must monitor the H₂S of any fuel gas burned using a CEM meeting the requirements of 40 CFR 60.105(a)(4).

The heaters must comply with the hourly and rolling 365-day heat input limits listed under Project Description in this Statement of Basis. The facility is required to monitor and record MMBTU heat input for each heater hourly and on a rolling 365-day basis, calculated daily, to demonstrate compliance. The heat input of refinery fuel gas must be monitored at the 862 Unit continuous heat input monitor or tested daily.

Each heater must have an annual adjustment or tuneup meeting the requirements of PA Code §129.93(b)(2) and (5). This was a case-by-case RACT requirement from the RACT Plan Approval.

The Unit 137 and Unit 210 Crude Units have the rolling 365-day feed rate limits listed under Project Description. Compliance is demonstrated through recordkeeping.

Case-by-Case RACT

Since there was an increase in the heat input capacity for these heaters, PES submitted a new case-by-case RACT analysis for NO_x controls. The following controls were determined technologically feasible for most heaters: Selective Catalytic Reduction (SCR), Ultra Low-NO_x Burners (ULNB), Selective Non-Catalytic Reduction (SNCR), Low-NO_x Burners and Flue Gas Recirculation (LNB & FGR), LNB and SCR, and LNB and SNCR. SCR and FGR were determined technically infeasible for 865 Heater 11H1 because they do not physically fit the plot space. The NO_x control option determined as RACT in the original RACT plan approval was Combustion Tuning.

Source	Control Device Options (\$ per ton NO _x controlled in 1999 dollars)					
	UNLB & SCR	UNLB & SNCR	SCR	ULNB	SNCR	LNB & FGR
137 Heater F-	9,471	8,067	5,941	5,479	5,941	8,115

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210 Heater H101	N/A	N/A	N/A	N/A	N/A	N/A
210 Heater H201A/B	N/A	N/A	N/A	N/A	N/A	N/A
865 Heater 11H1	Tech. infeasible	8,166	Tech. infeasible	1,520	9,344	3,430
865 Heater 11H2	14,618	11,365	13,973	2,334	11,091	10,181
866 12H1 Heater	14,750	11,426	14,122	2,353	11,153	10,318
868 8H101 Heater	13,394	11,463	12,589	2,360	11,167	7,913
231 Heater B101	6,503	6,323	5,328	1,736	5,032	2,885

Based on the following NOx control efficiencies (2012):

UNLB & SCR – 96%

ULNB & SNCR – 53%

SCR – 85%

ULNB – 74%

SNCR – 40%

LNB&FGR – 55%

210 Heater H101 had LNB for gas burning at the time of the original RACT plan approval and was not re-evaluated for case-by-case RACT.

210 Heater H201A/B has ULNB from a previous plan approval and was not re-evaluated for case-by-case RACT.

NOx control efficiencies are based on 2012 technology. The cost analysis was based on 1999 costs. Under the new capacities and control efficiencies, all NOx control technologies still would have been determined economically unreasonable.

Single Source Determination

On August 7, 2012, the Pennsylvania Department of Environmental Protection (PADEP) issued an administrative amendment to Title V Operating Permit No. 23-00001 for Sunoco Marcus Hook Refinery including language that the sources located at Sunoco's Marcus Hook and Philadelphia Refineries shall be considered as a single facility for NSR, PSD and Title V applicability purposes. The rationale for this decision is detailed in their July 26, 2012 Title V Operating Permit Review Memo (Administrative Amendment) for Title V Operating Permit No. 23-00001.

On August 7, 2012, AMS issued an Administrative Order to Sunoco Philadelphia Refinery Concurring with PADEP's determination that the sources located at the Marcus Hook and Philadelphia Refineries shall be considered a single source for NSR, PSD, and Title V applicability purposes. AMS added language stating this to the draft Title V operating permit renewal for Sunoco Philadelphia Refinery.

For more information, please see the attached July 26, PADEP Title V Operating Permit Review Memo (Administrative Amendment) and August 7, 2012 AMS Administrative Order.